(51) International Patent Classification 6 : H04N 7/16, 7/00, 17/00	A1	(11) International Publication Number: **WO 00/21297**
		(43) International Publication Date: 13 April 2000 (13.04.00)

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(54) Title: APPARATUS AND METHOD FOR PREVENTING UNAUTHORIZED CIRCUMVENTION OF TELEVISION PROGRAM BLOCKING FUNCTION

(57) Abstract

A method and apparatus for preventing unauthorized circumvention of blocking of television programs. The system of the present invention prevents an unauthorized person from circumventing the VChip blocking of a specific show or channel through tuning with the cable box. A controller monitors the vertical synchronization (VSyncs) of the video signal coming into the TV (102). If a video interrupt is identified by the controller without the TV sending an IR command to the cable box, the controller redials the cable box to the channel it was on before detecting the video interrupt. This hinders an unauthorized person from working around VChip blocking functions.

1   APPARATUS AND METHOD FOR PREVENTING UNAUTHORIZED
                      CIRCUMVENTION OF TELEVISION PROGRAM BLOCKING FUNCTION

FIELD OF THE INVENTION

5   The present invention relates generally to parental control of television programs, and
more particularly, to a system for preventing unauthorized circumvention of television program
blocking functions.

BACKGROUND OF THE INVENTION

10   A system has been proposed in the United States and endorsed by the U.S. Congress
commonly known as the V-Chip System. The system involves using the vertical blanking
interval ("VBI") of a standard television signal to include a code which indicates one or more
rating factors for the program then being aired. These rating factors can include ratings similar
to those promulgated by the Motion Picture Association of America (e.g. G, PG, PG-13, R,
15   NC-17) and numerical ratings of individual categories of program nature such as violence,
language, nudity and sexual content. A consumer V-Chip television system would allow a
consumer to program his or her television system to exclude programs according to their
preferred levels of one or more of these rating criteria or alternatively could be programmed to
permit only programs having certain levels of content according to these rating categories.

20   A problem with the V-Chip system, specially when there is a cable box connected to the
TV, is that there is no feedback to the VChip controller (TV) as to whether the cable box is really
tuned to the intended channel. Any unauthorized person can walk up to the cable box control
panel or use a remote control to change the cable box channel without the TV knowing it.
Accordingly, an improvement of the V-Chip parental blocking system that cannot easily be
25   bypassed is needed.

SUMMARY OF THE INVENTION

              The present invention is directed to an apparatus and method that satisfies this need.
There is, therefore provided, according to one embodiment, an apparatus and method for
30   preventing unauthorized circumvention of V-Chip program blocking function. According to the
present invention, a child guard function prevents an unauthorized person from circumventing
the VChip blocking of a specific show or channel through tuning with the cable box. In one
embodiment, the child guard function is implemented within a VChip or a VChip Plus+. The
child guard function monitors the vertical synchronization (VSyncs) of the video signal coming
35   into the TV.

              Because during a channel change, the time between VSyncs is different, a controller can
detect whether a channel change has taken place by monitoring the timing between successive
VSyncs of the video signal and comparing it to a predetermined value. If a video interrupt is

1   identified by the child guard controller without the TV sending an IR. command to the cable box.
            the controller redials the cable box to the channel it was on before detecting the video interrupt.
            This hinders an unauthorized person from working around VChip blocking function.

                    It is understood that other embodiments of the present invention will become readily
5   apparent to those skilled in the art from the following detailed description, wherein it is shown
            and described only embodiments of the invention by way of illustration of the best modes
            contemplated for carrying out the invention. As will be realized, the invention is capable of other
            and different embodiments and its several details are capable of modification in various other
            respects, all without departing from the spirit and scope of the present invention. Accordingly,
10   the drawings and detailed description are to be regarded as illustrative in nature and not as
            restrictive.

            DESCRIPTION OF THE DRAWINGS
                    These and other features, aspects, and advantages of the present invention will become
15   better understood with regard to the following description, appended claims, and accompanying
            drawings where:
                    FIG. 1A is a block diagram of a typical TV and cable box configuration;
                    FIG. 1B, is an exemplary flow process for child guard function;
                    FIG. 2 is an electrical block diagram of the parental control apparatus in accordance with
20   one embodiment of the present invention;
                    FIG. 3 is an electrical block diagram of the parental control apparatus used in a cable
            system in accordance with one embodiment of the present invention;
                    FIG. 4 is an electrical block diagram of a parental control apparatus in combination with
            a V-Chip system employing VCR Plus+ and automated channel mapping in accordance with one
25   embodiment of the present invention;
                    FIG. 5 is an electrical block diagram of a parental control apparatus in combination with
            VCR Plus+ integrated circuit retrofitted into an existing V-Chip system;
                    FIG. 6 is a top plan view of a remote controller for operating the system of FIG. 4 in
            accordance with one embodiment of the present invention; and
30   FIG. 7 is a simplified timing diagram for some exemplary successive VSyncs.

            DETAILED DESCRIPTION
                    The present invention is directed to a system for preventing unauthorized circumvention
            of the V-Chip-based parental control system. Such a parental control system is described in U.S.
35   Patent No. 5,382,983, which is hereby incorporated by reference as if set forth in full herein. A
            controller distinguishes the time difference between VSyncs during a channel change caused by
            the disturbances in the video signal. If a difference in Vsyncs is detected, the controller sends
            an IR signal to the cable box to tune it to the correct channel.

1   FIG. 1 shows a typical arrangement for a cable box and a TV connection in one
embodiment of the present invention. A television signal from a cable feed in inputted to cable
box 7. The cable box 7 has a channel changing control. The output of the cable box, which is
the signal corresponding to a user selected channel is inputted to the TV receiver 8. TV receiver
5   8 includes a VChip Plus+ controller circuitry or a VChip control circuitry. The VChip Plus+
controller circuitry and the VChip control circuitry may be included inside of TV receiver 8, or
may be a part of a separate device electrically connected to televison receiver 8. TV receiver 8
may be any conventional TV receiver, a digital TV, a PC/TV, or any other embodiment of an
electronic device that is capable of receiving, processing and displaying television signals. A
10   remote control device 9a may be used to change the channels in the cable box 7 and/or in the TV
receiver 8.

           The VChip controller included with the TV receiver 8 keeps track of which channel is
being tuned to at any time. The tuning of the channel may be carried out directly inside the TV,
or in the case of a cable box being used, it may be performed by the VChip controller (TV)
15   emitting some IR signals to the cable box. However, because the tuning mechanism between the
VChip controller and the cable box is typically one-directional only, there is no feedback to the
VChip controller as to whether the cable box is really tuned to the intended channel.

           Nonetheless, the VChip controller is capable of determining whether a channel change has
taken place or not by monitoring the timing between successive VSyncs of the video signal.
20   During a channel change, the time between VSyncs will be different for one or two cycles. This
difference is caused by the disturbance in the video signal when tuning takes place and is used
in determining whether a channel change has take place. If a difference in VSyncs is detected,
the controller sends an IR signal to the cable box to tune it to the correct channel.

           Referring now to FIG. 1B, a flow process for the child guard function is shown.
25   Whenever there is a tuning event, there is a difference in the Vertical Sync timing ("VSync
Disturbance"). Because the controller knows the exact time that the tuning signals are being sent,
in block 101, it sets a "timing window" after the tuning signals are sent. The controller then
monitors the timing between successive VSyncs of the video signal, as shown in block 102. As
illustrated by block 103, if the VSync Disturbance occurs outside of the "timing window", then
30   one of the two of the following event has occurred.

           (1) The Disturbance came from the TV channel source itself, or

           (2) Someone has tuned the cable box directly, by remote controller or from the panel.

           In either case, in block 104, the controller tunes the cable box channel to some channel
(other than the final correct channel). In block 106, the controller tunes the cable box back to the
35   correct channel. During the last step of tuning back to the correct channel, the controller sets up
a "timing window" after the IR signal has been sent, as shown in block 105.

           As depicted in block 107, if there is no "VSync Disturbance" detected in the "timing
window", the controller concludes that the IR-signal path has been covered up and that the

1   previous "VSync Disturbance" was from someone trying to circumvent the system. The
     controller blocks the screen, as shown in block 108. If "VSync Disturbance" is detected within
     the "timing window", the controller recognizes that the cable box has been tuned back to the
     correct channel and does not do anything special, as illustrated in block 109.

5   An embodiment of a parental control system for use with the V-Chip system described
     above is shown in FIG. 2. A multichannel radio frequency (RF) television signal from a cable
     feed is connected to the input of a cable box 10, which has a channel changing control. The
     output of cable box 10, which is a single channel RF television signal at the frequency of the user
     selected channel, is coupled to television drive circuitry 12. The output of the television drive
10   circuitry 12 is connected by a transmission blocking circuit 14 to a TV display 16. Blocking
     circuit 14 could be a conventional analog signal transmission gate, a digital blocking module, or
     any other similar device known in the art.
           For the purpose of describing the operation of the parental control system, it is assumed
     that the television signal of each channel carried by the cable feed contains supplemental data,
15   including channel identification, such as HBO, CNN, or NBC. Preferably, the channel
     identification is embedded in the VBI of the signal of each channel in an XDS format.
           The output of the television drive circuitry 12 is also connected to the input of a VBI
     decoder 18, which strips the XDS signal from the baseband television signal. The output of VBI
     decoder 18, which includes a data signal representative of the channel identification of the
20   channel to which the cable box 10 is tuned, is coupled to a microprocessor 20, the output of
     which controls the blocking circuit 14. The microprocessor 20 is coupled to a RAM 22.
           The programs to be selectively blocked are stored in RAM 22. For each program the date,
     time, channel and program length are stored in RAM 22 in a stack arrangement as described in
     U.S. Patent No. 5,382,983 ("the '983 patent") and co-pending U.S. application 08/684,678, the
25   disclosures of which are hereby incorporated by reference as if set forth in full herein. The
     program blocking data base stored in RAM can be generated in a number of different ways. One
     way is to transmit groups of program data consisting of date, time, channel, and length content
     according to a customized rating service, as composed for example by a religious group,
     newspaper, or political association, and to download such data to RAM 22 from the VBI of the
30   television signal or a telephone line.
           The user can call up an on-screen menu of choices of customized rating services that are
     transmitted in the VBI or telephone line, key in the selected service, and command the
     microprocessor 20 to download the group of program data corresponding to the selected service.
     Another way is to key in the data of the individual programs through a remote controller. A third
35   way is to select the programs with a cursor from an on screen electronic program guide ("EPG"),
     in which the EPG data base is used both to determine the programs to be blocked and the
     programs to be viewed or recorded.

1   In any case. the microprocessor 20 continuously monitors the output of a real time clock
in the microprocessor 20, and the channel identification of the channel to which cable box 10
is tuned. which is recovered by VBI decoder 18 or by monitoring the tuner and using a channel
map. These monitored attributes are compared with the data of the program blocking database.
5   Preferably, this is accomplished by arranging the data base in a stack in RAM 22 as described in
the '983 patent such that the top of the stack is the next program telecast to be blocked. When
a match is found. the microprocessor 20 actuates the blocking circuit 14, thereby preventing the
TV display 16 from showing the program.

           When an override system is used in conjunction with the V-Chip system, a code is also
10   included in the VBI which indicates one or more rating factors for the program then being aired.
In this embodiment, the user programs the television system to exclude programs according to
one or more of these rating criteria. The user selections are stored in RAM 22. and compared with
the code transmitted in the VBI. In the event an excluded program is detected by the
microprocessor 20, via the VBI decoder 18, an enable override list stored in RAM 22 is
15   consulted. The blocking circuit 14. under microprocessor control, prevents the excluded program
from being presented to the TV display 16 if the program is not contained in the enable override
list. Conversely, if the program currently being aired is not excluded under the rating criteria
established by the user. a blocking override list stored in RAM 22 is checked by the
microprocessor 20. The blocking circuit 14, under microprocessor control, allows the program
20   to pass to the TV display 16 if the program is not contained in the blocking override list.

           In the described embodiment where the TV programs comprising the blocking override
list and the enable override list are defined by channel, date, start time and length (or ending
time), or through the use of compressed codes such as those described in U.S. Patent
No. 5,335,079, an alternative arrangement is necessary to accommodate the addition of a cable
25   box or video cassette recorder ("VCR").

           With conventional cable box or VCR hook-ups, a cable box or VCR is connected to the
front end of the TV receiver. The cable box, or VCR, has a tunable bandpass filter for tuning the
desired channel. The television signal from the tuned channel is modulated onto a fixed carrier
frequency, by way of example channel 3, and coupled to the TV receiver. The TV receiver is
30   tuned to the carrier frequency output of the cable box, or VCR, regardless of the particular
channel selected.   Since the TV receiver is always tuned to the fixed frequency, the
microprocessor of FIG. 2 will be unable to ascertain when a blocked or selected TV program is
selected at the cable box, or VCR.

           Turning to FIG. 3, one embodiment of the present invention is shown which
35   accommodates a system employing both a cable box and a VCR implemented with a low cost
mechanization using a simple switch S1. The VCR tuning issue is resolved by connecting the
video input of the VCR 23 to the video output of the TV tuner 24, which is always tuned to a
parentally enabled program.

1   With respect to cable box tuning, the cable box 26 is used for tuning scrambled programs. During setup, the user identifies the scrambled (premium) channels in his or her cable lineup. This can be automated or performed manually. In this embodiment, the scrambled program providers will transmit their names (HBO ESPN, etc.) in the VBI of the television signal.

5   Accordingly, when a scrambled channel is selected by the user, the cable box 26 is tuned to the respective channel, and the VBI is scanned for the name, via VBI decoder 28. If the name cannot be identified, the channel is blocked.

           VCR recording may also be controlled by providing the VCR video input with the same signal that is provided to the display 30 by the TV tuner 24. This signal has already been

10   processed to ensure that it contains a program that has been authorized. Hence, the user can only record authorized programs.

           In operation, when a user requests a non-scrambled channel, the microprocessor 32 checks to see (from setup table) if the requested channel is designated as a scrambled channel, and also checks to see (from PlusCode table) if this channel is unblocked for the particular time slot. If

15   the TV channel is unblocked and non-scrambled, switch S1 is set to position 2 and the TV tuner 24 is tuned to the requested channel. If the requested channel is to be blocked, S1 is set to position 4, so the TV tuner 24 has no input. The user may also record the displayed program (but no other program since the VCR video input comes from the TV tuner output).

           If the user requests a scrambled channel, the microprocessor 32 checks to see if the

20   requested channel is designated as a scrambled channel, and also checks to see (from PlusCode table) if this channel is unblocked for the particular time slot. If the TV channel is unblocked and scrambled, S1 is set to position 3, and the cable box 26 is tuned to the requested channel. The VBI decoder 28 monitors the cable box output, looking for the channel name in the VBI (broadcast say every minute). If a name is found, it is compared to the channel name in the

25   channel setup table. If a match is detected, the TV tuner 24 is tuned to channel 3, and the program is displayed. If no match is detected, S1 is switched to position 4, and the display 30 is blanked. Thus, if the user tries to manually change the cable box channel, the VBI name check will fail and S1 will be switched to position 4 to blank the display. The user may also record the displayed program (but no other program since the VCR video input comes from the TV tuner

30   output).

           If the user requests to play a tape in the VCR, S1 is switched to position 1, and the TV tuner 24 is tuned to channel 3. Note that in position 1, the VCR has no RF/video input. Hence the user cannot use the VCR tuner.

           Turning to FIG. 4, a block diagram of one embodiment of the present invention is shown

35   incorporating the V-Chip system with the override system ("V-Chip Plus+ system"). Preferably, the V-Chip Plus+ system is responsive to compressed codes for creating the override lists, such as those described in U.S. Patent No. 5,335,079, and includes automatic channel mapping capability. Specifically, a TV tuner 34 is positioned at the front end of the TV receiver for

1   passing a selected channel of a multichannel RF television signal. The TV tuner 34, which can be any conventional tuner in the art, including a PC/TV or a digital TV, provides amplification, down-conversion to an intermediate frequency ("IF") and demodulation, as well as frequency tuning.

5   The TV tuner 34 is coupled to television drive circuitry 36 which provides the signal processing required to amplify and down-convert the IF signal to a baseband television video signal. The output of the television drive circuitry 36 is connected to a blocking circuit 38. The blocking circuit 38 could be a conventional analog signal transmission gate, a digital blocking circuit or any other similar device known in the art. The output of the blocking circuit 38 is

10   connected to a TV display 42 through a video mixer 40 for selectively displaying the TV program currently being broadcast on the selected channel.

The TV tuner 34 is tuned to the selected channel by a microprocessor 44. A user input device 46, preferably in the form of a remote infrared ("IR") controller, is coupled to the microprocessor 44 to provide user control of the TV channels. The user input device 46 also

15   allows the user to remotely program the V-Chip Plus+ system to exclude programs according to one or more rating factors, as well as compiling or modifying the V-Chip Plus+ override lists.

When the user wishes to review the particular ratings set in the V-Chip Plus+ system or the V-Chip Plus+ override lists, the microprocessor 44 retrieves the appropriate information from RAM 48 and couples it to the video processor 50, where the information is formatted for display.

20   Preferably, the information stored in the video processor 50 is a bit map of what is displayed on the TV display 42. The video processor 50 is connected to the video mixer 40. The video mixer 40 outputs the information as an overlay on the TV program currently being viewed, although it will be understood by those skilled in the art that the information from the video mixer 40 could be presented to the TV display 42 as a window in the TV program or as a full screen

25   display instead of the TV program.

Using the user input device 46 in conjunction with the information presented to the TV display, the user programs the V-Chip Plus+ system to exclude programs according to one or more rating factors. Preferably, the user input device 46 allows manipulation of the V-Chip Plus+ rating system and the V-Chip Plus+ override lists by moving a cursor on the TV display

30   42 and inputting discrete commands. Cursor control is achieved by coupling the microprocessor 44 to the video processor 50 through to a cursor position register 52.

User edits to the V-Chip Plus+ override lists presented to the TV display 42 may be accomplished using compressed codes such as those described in U.S. Patent No. 5,335,079. A G-code decoder 54 is employed to process the compressed codes. If the microprocessor 44

35   determines that a G-code has been received from the user input device 46, then the G-code will be sent to the G-code decoder 54 for decoding. The G-code decoder 54 converts the G-code into channel, date, time and length ("CDTL") information which is used by the microprocessor 44 to

1   override the V-Chip Plus+ rating system for individually selected TV programs. The CDTL information is stored in RAM 48 in a stack arrangement as described in U.S. patent 5,382,983.

The V-Chip Plus+ system is implemented by decoding the VBI of a television signal. A VBI decoder 56 connected to the output of the television drive circuitry 36 extracts the XDS
5   signal from the baseband television signal. The output of the VBI decoder 56, which includes one or more rating factors for the TV program currently broadcast, is coupled to the microprocessor 44. These rating factors extracted from the VBI of the television signal are compared with the user programmed rating factors in RAM 48 by the microprocessor 44. In the event that the microprocessor 44 determines that the TV program currently broadcast should be
10   blocked based on the programmed rating factors, the enable override list stored in RAM 48 is consulted. The microprocessor 44 will actuate the blocking circuit 38 to block the currently broadcast TV program from the TV display 42 if the TV program is not contained in the enable override list.

Conversely, if the TV program currently broadcast should be televised based on the
15   programmed rating factors stored in RAM 48, the blocking override list stored in RAM 48 is consulted. The blocking circuit 38, under microprocessor 44 control, allows the TV program to pass to the TV display 42 if the TV program is not contained in the blocking override list. The V-Chip Plus+ override lists are consulted by the microprocessor 44 by comparing the CDTL information stored in RAM 48 with the tuner channel set by microprocessor 44 and an internal
20   clock (not shown) in the microprocessor. Alternatively, the channel information can be striped from the XDS data by the VBI decoder 56, if available there.

Briefly, the particular type of television service is automatically detected in an embodiment of the present invention by monitoring the channel allocations of the TV stations. This accomplished by sweeping the TV tuner 34 across its RF band with the microprocessor 44.
25   A detector 57, coupled to the TV tuner 34, detects whether a TV station has been allocated to each of the channels as the TV tuner 34 is swept across the RF band by monitoring the stability of the horizontal sync pulses. The microprocessor 44 can then determine the type of television service based on the channel allocation for a given geographic area. This scheme requires only that the users key in their zip codes using the user input device 46. Alternatively, the automatic
30   detection of the particular television service used by the user can be eliminated in favor of having the user key in directly the information pertaining to the model and brand of the VCR and cable box using the user input device 46.

Once the particular type of television service used by the user is ascertained, the appropriate channel map can be extracted by the VBI decoder 56 from the television signal based
35   on the geographic location of the user. The microprocessor 44 again sweeps the TV tuner 34 to locate a channel having channel map information transmitted in the VBI portion of the television signal. The microprocessor 44 then extracts the channel map marked with an identification code

1   corresponding to the geographic location entered by the user and stores the extracted channel map
       in channel map memory 58.

              The described embodiment of the V-Chip Plus+ system illustrated in FIG. 4 is directed
       to a fully integrated system utilizing a single microprocessor. However, those skilled in the art
5   will readily appreciate that numerous applications may arise where it would be desirable to
       retrofit the V-Chip Plus+ system into a TV receiver with an existing V-Chip system. As a result
       of Congressional endorsement of the V-Chip system, it is envisioned that many TV
       manufacturers will develop a V-Chip IC ("IC") for user programing according to a standardized
       rating system, and include the V-Chip capability as a standard feature. In these systems, it would
10   be advantageous to incorporate a V-Chip Plus+ upgrade into a single IC which could be easily
       integrated into an existing V-Chip system. An exemplary embodiment of such a V-Chip Plus+
       system is shown in FIG. 5.

              Referring to FIG. 5, the V-Chip system includes the basic television processing and drive
       circuitry described with reference to FIG. 4. Specifically, a TV tuner 35 is positioned at the front
15   end of the TV receiver for passing a selected channel of a multichannel RF television signal to
       television drive circuitry 37. The output of the television drive circuitry 37 is connected to a
       blocking circuit 39. The output of the blocking circuit 39 is connected to a TV display 43
       through a video mixer 41 for selectively displaying the TV program currently being broadcast
       on the selected channel.

20   A V-Chip 57, connected to the output of the television drive circuitry 37, extracts the XDS
       signal from the baseband television signal. The rating factors for the TV program currently
       broadcast are stripped from the XDS data and are compared with the user programmed rating
       factors stored in internal memory of the V-Chip 57. In the event that the V-Chip 57 determines
       that the TV program currently broadcast should be blocked based on the programmed rating
25   factors, the blocking circuit 37 is actuated by the V-Chip 57 to block the currently broadcast TV
       program from the TV display 43. Conversely, if the TV program currently broadcast should be
       televised based on the programmed rating factors stored in memory, the blocking circuit 39 is
       deactivated by the V-Chip 57 and the TV program is allowed to pass to the TV display 43.

              The V-Chip system provides user's editing of the rating factors by using an Editor.
30   Specifically, when the user wishes to review the particular ratings set in the V-Chip system, the
       V-Chip 57, under control of the user input device, retrieves the appropriate information from
       memory and couples it to the video processor 51, where the information is formatted for display.
       The video processor 51 is connected to the video mixer 41. The video mixer 41 outputs the
       information as an overlay on the TV program currently being viewed, although it will be
35   understood by those skilled in the art that the information from the video mixer 41 could be
       presented to the TV display 43 as a window in the TV program or as a full screen display instead
       of the TV program. Using the user input device in conjunction with the information presented

1   to the TV display 43. the user programs the V-Chip system to exclude programs according to one
         or more rating factors.

         Customization of the blocking function of the V-Chip 57 is achieved with an external V-
         Chip Plus+ IC 47. The implementation of the V-Chip Plus+ circuitry into an IC is an economical
5   approach. however. it will be understood by those skilled in the art that the V-Chip Plus+
         function could be implemented using discrete components. Preferably, the V-Chip Plus+ IC 47
         is designed for easy retrofit into an existing TV receiver with V-Chip capability already installed.
         The V-Chip Plus+ IC 47 is inserted in line between the V-Chip 57 and the blocking circuit 39.
         This requires disconnecting the V-Chip 57 from the blocking by removing wire 59.   I   n
10   operation, when the V-Chip 57 determines that the TV program currently broadcast should be
         blocked based on the programmed rating factors, the blocking signal is coupled to the V-Chip
         Plus+ IC 47. In response to the blocking signal, the microprocessor 45 in the V-Chip Plus+ IC
         47 consults an enable override list stored in RAM 49. The microprocessor 45 will actuate the
         blocking circuit 39 to block the currently broadcast TV program from the TV display 43 if the
15   TV program is not contained in the enable override list. Conversely. if the V-Chip 57 determines
         that the TV program currently broadcast should be televised based on the programmed rating
         factors, the unblocking signal is coupled to the V-Chip Plus+ IC 47. In response to the
         unblocking signal. a blocking override list stored in RAM 49 is consulted. The blocking circuit
         39, under microprocessor 45 control, allows the TV program to pass to the TV display 43 if the
20   TV program is not contained in the blocking override list.

         The V-Chip Plus+ IC 47 is also connected to the video processor 51 for user edits to the
         V-Chip Plus+ override lists. In this configuration. the user can program the V-Chip system to
         exclude programs according to one or more rating factors, as well as compiling or modifying the
         V-Chip Plus+ override lists. When the user wishes to review or edit the V-Chip Plus+ override
25   lists, the microprocessor 45 retrieves the appropriate information from RAM 49 and couples it
         to the video processor 51, where the information is formatted for display. The video processor
         51 outputs the information, via the video mixer 41. preferably as an overlay on the TV program
         currently being viewed. Edits to the V-Chip Plus+ override lists are accomplished using, by way
         of example, compressed codes. A G-code decoder 55 is employed to process the compressed
30   codes in the same manner as described above with reference to the embodiment illustrated in
         FIG. 4.

         The user input device 46 preferably takes the form of a hand-held remote IR transmitter
         which communicates with an IR receiver connected to the microprocessor 44. As shown in FIG.
         6, the IR transmitter has a housing 60 on which a number of control keys are mounted. A
35   CHANNEL SURF key 62, a V-CHIP PLUS+ key 64, a REVIEW key 69, a BABYSITTER key
         71, a MENU key 63, an ENTER key 65, and a CHANGE key 67 are all provided on the housing
         60. Located below the REVIEW key 69 and the BABYSITTER key 71 are up, down, left and
         right arrow keys 66, 68, 70 and 72. respectively. A numerical keypad 73 is positioned below the

1   ENTER key 65 and CHANGE key 67. The blocking and unblocking functions are set and
selected in two different modes, a TV mode and a GUIDE mode.

In a TV mode, preferably, the user interface is fully menu driven. On-screen options are
presented to the TV display for programming the V-Chip Plus+ system, and editing the V-Chip
5   Plus+ override lists. These on-screen options can be accessed from the normal TV picture
viewing mode by selecting either the CHANNEL SURF key 62, the V-CHIP PLUS+ key 64, or
the MENU key 63 on the user input device. In a Guide mode, the user interface is provided
through an electronic program guide displayed on the screen. On-screen options within the
program guide are presented to the TV display for programming the V-Chip Plus+ system, and
10   editing the V-Chip Plus+ override lists. Pressing the VCR Plus+ key on the remote displays the
VCR Plus+ interface in the Guide's Schedule screen. The users may input a Plus Code and then
select the action they wish to take on the program: record (the default), watch, or block. These
options appear as tiles in an area within the guide.

Referring now to FIG. 7, an example of Vsync timing and its relationship to a cable box
15   channel change is shown. The VChip controller is capable of distinguishing between the case
of tuning by the controller and the case of someone trying to circumvent the VChip blocking
function. If the tuning is initiated by the controller, the controller sets a timing window for
VSync disturbances right after the tuning signals have been sent. If the difference in VSync
timings is detected within this timing window, then the controller determines that the channel
20   change is legitimate, as shown in FIG. 7. An example for the period between VSyncs is 16.67
milliseconds for some cable boxes. If the timing difference is detected outside of this window,
then the controller would take the following actions:

(a) if the correct channel is 2, the controller sends an IR signal to tune the cable box to
channel 3, and then sends another IR signal to tune it back to the correct channel (channel 2).
25   (b) if the correct channel is something other than 2 (e.g., channel x), then the controller
sends an IR-signal to tune the cable box to channel 2, followed by another IR-signal to tune it
back to channel x (the correct channel).

However, there are rare instances that the VSync timing itself would "glitch" even when
no channel tuning happens. In other words, there may be times (only rarely) that the VSync
30   timing would change from the previous frame. For example, this can happen in the case of "split
channel", where one channel would be broadcasting programs from different sources during
different times of the day. When the program sources change, the VSync timing also changes.
The above method and system are designed to take care of this situation. The controller tunes
the cable box to an adjacent channel first, and then tunes it back to the correct channel.

35   Nevertheless, anybody can use an object to cover up the IR signal from the controller, and
then manually tune the cable box to any channel that the person wants. To prevent this, during
the process of tuning back to channel x (the correct channel), the controller sets a timing window,
similar to what is done in the normal tuning process. If a VSync timing difference is NOT

1   detected within this timing window, the controller concludes that someone is tampering with the process and blocks the video screen.

The "adjacent" channel tuning is to ensure that the next step "tuning back to the correct channel" causes a difference in the VSync timing. Some "smart" cable boxes keep track of the
5   current channel number. If a new channel number which equals to its current channel number is received, a "smart" cable box will not do the tuning. As a result, there will not be any VSync timing difference, as if someone has blocked the IR signal path. If the "adjacent" channel tuning step is omitted, the controller fails detection the difference when the timing difference was from the channel itself. Thus, the "adjacent" channel tuning ensures that there is a difference in the
10   VSync timing during the "tuning to the correct channel" step.

However, if the "window" setting is too wide, the system can be defeated. For example, assuming the correct channel (current channel) is channel 5 and an unauthorized person wants to tune to channel 11, which is on the "blocked list." The unauthorized person proceeds to manually tune the cable box channel to channel 11. However, the VChip controller detects the
15   "VSync Disturbance" from the tuning to channel 11. It immediately sends out the IR-signal to tune it to channel 2. It does not matter whether the IR-signal is blocked at this point. The VChip controller then sends another IR-signal to tune the cable box back to channel 5, with a timing window set right after the signal. The unauthorized person at this point can use an object to block the controller IR signal, and try to tune the Cable box manually to channel 9 at the same
20   time. If the timing window is set properly, the "VSync Disturbance" created by the manual tuning performed by the unauthorized person is not detected within the timing window and the screen is blocked.

Since the tuning process inside the cable box starts when the last digit of the channel number is received (or in some cases the "enter-key"), the system can be made more secured by
25   randomizing the time between the digits of the channel numbers (up to the limit of the inter-digit timing of the Cable box brand). The objective of this is to make the circumvention process more difficult.

The value for the timing window varies according to the type and brand of cable boxes. However, the exact setting of the timing window for each type of cable box can be determined
30   to a fairly high accuracy. In one embodiment, determination of the timing window is automatically performed by the controller. The controller determines the timing window by sending out a IR-signal to tune the cable box to a first channel. Then, the controller sends another IR signal to tune the cable box to some other channel to measure the time between the "VSync Disturbance" and the tuning IR signals. An extra margin may then be added to the
35   measured timing window as a threshold.

For example, the controller sends an IR-signal to tune the cable box to channel 9 and then seeks a confirmation on whether the cable box has been tuned to channel 9. After the brand has been identified, the controller can send other IR signals to tune the cable box to some other

1   channels that have a high likelihood of having real broadcast signals, so as to measure the time between the "VSync Disturbance" and the tuning IR signals. A suitable combination would be channel 3 and channel 4 - either one of them carries real signals. A small timing margin can then be added to the measured time and be used as the timing window setting. The above process may

5   be carried out during the "cable box brand setup" process or during the first use of the cable box by the user. The established timing window can then be saved in a memory such as a non-volatile memory for future references. This saved timing window may be manually adjusted by a user using a password.

In another embodiment, the timing window is dynamically determined by the controller

10   over a range of operating periods. Adequate buffering is provided to store timing between VSyncs over a period of operation. A timing window including the appropriate threshold is determined from the buffered data. The advantage of this method is that if for some reason the VSync timing changes, the controller automatically will adjust for it. Also, anomalies in timing are "averaged out" over a range of buffered data. The established timing window can then be

15   saved in a memory such as a non-volatile memory for future references. This saved timing window may be manually adjusted by a user using a password.

It will be recognized by those skilled in the art that various modifications may be made to the illustrated and other embodiments of the invention described above, without departing from the broad inventive scope thereof. It will be understood therefore that the invention is not

20   limited to the particular embodiments or arrangements disclosed, but is rather intended to cover any changes, adaptations or modifications which are within the scope and spirit of the invention as defined by the appended claims.

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1   CLAIMS:

        1.   A method for preventing unauthorized circumvention of a television program
                blocking system including a cable box and a television tuner, said method
                comprising the steps of:

5   setting a first timing window;

        monitoring timing between successive VSynchs of a video signal from the cable box to
the television tuner;

        if the timing between successive VSynchs is not detected within the first timing window,
recognizing an unauthorized channel change and tuning the cable box to a second channel; and

10   tuning the cable box back to the channel that the cable box was tuned to before the
unauthorized channel change took place.   .

        2.   The method of claim 1 further comprising the steps of:

        setting a second timing window;

15   monitoring timing for next VSynch of the video signal;

        if the timing for next VSynch is not detected within the second timing window, activating
a function.

        3.   The method of claim 2 wherein the activated function is blocking the video signal.

20

        4.   The method of claim 2 wherein the first timing window is the same as the second
timing window.

        5.   The method of claim 1 wherein the step of setting a first timing window comprises
25   measuring the period between two successive tuning events.

        6.   The method of claim 5 further comprising adding a threshold value to the measured
period.

30   7.   The method of claim 1 wherein the step of setting a first timing window comprises
measuring timings between a plurality of successive tuning events and taking average of the
measured timings.

        8.   A system for preventing unauthorized circumvention of a television program
35   blocking system comprising:

        a cable box for receiving a plurality of video signals;

        a television tuner electrically coupled to the cable box for receiving a video signal;

        means for setting a first timing window;

1   means for monitoring timing between successive VSynchs of the video signal from the
cable box to the television receiver;

               if the timing between successive VSynchs is not detected within the first timing window,
means for tuning the cable box to a second channel; and

5   means for tuning the cable box back to the channel that the cable box was tuned to before
the unauthorized channel change took place.

               9.   The system of claim 8 further comprising:

               means for setting a second timing window;

10   means for monitoring timing for next VSynch of the video signal;

               if the timing for next VSynch is not detected within the second timing window, means for
activating a function.

               10.   The system of claim 9 wherein the activated function is blocking the video signal.

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               11.   The system of claim 9 wherein the first timing window is the same as the second
timing window.

               12.   The system of claim 8 wherein the means for setting a first timing window

20   comprises means for measuring the period between two successive tuning events.

               13.   The system of claim 12 further comprising means for adding a threshold value to
the measured period.

25   14.   The system of claim 8 wherein means for setting a first timing window comprises
means for measuring timings between a plurality of successive tuning events and means for
taking average of the measured timings.

               15.   A method for preventing unauthorized circumvention of a television program

30   blocking function comprising the steps of:

               tuning a cable box to a first channel responsive to a channel change command from a
television receiver electrically coupled to the cable box;

               monitoring timing between successive VSynchs of a video signal from the cable box to
the television receiver;

35   comparing the monitored VSynchs timing to a predetermined value to determine whether
an unauthorized channel change has taken place;

               if the VSynchs timing does not agree with the predetermined value, recognizing an
unauthorized channel change and tuning the cable box to a second channel; and

1   tuning the cable box back to the first channel.

         16.   The method of claim 15 wherein the predetermined value is a timing window set
         by a controller.

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         17.   The method of claim 16 wherein the timing window is set by measuring the period
         between two successive tuning events.

         18.   The method of claim 16 wherein the timing window is set by measuring timings
10   between a plurality of successive tuning events and taking average of the measured timings.

         19.   A child guard system for preventing unauthorized circumvention of a television
         program blocking function comprising the steps of:
                a cable box to tuned to a first channel responsive to a channel change command from a
15   television receiver electrically coupled to the cable box;
                a controller for monitoring timing between successive VSynchs of a video signal from the
         cable box to the television receiver;
                means for comparing the monitored VSynchs timing to a predetermined value to
         determine whether an unauthorized channel change has taken place;
20   if the VSynchs timing does not agree with the predetermined value, means for tuning the
         cable box to a second channel; and
                means for tuning the cable box back to the first channel.

         20.   The system of claim 19 wherein the controller is a VChip controller.

25
         21.   The system of claim 19 wherein the controller is a VChip Plus + controller.

         22.   A method for preventing bypassing of a television parental control system including
         a cable box and a television set, said method comprising the steps of:
30   monitoring timing between successive VSynchs of a video signal for a first channel from
         the cable box to the television receiver;
                responsive to the monitored timing, recognizing an unauthorized channel change and
         causing the cable box to tune to a second channel; and
                tuning the cable box back to the first channel.

35
         23.   A system for preventing bypassing of a television parental control system
         comprising:
                a cable box for receiving a plurality of video signals;

1   a television tuner electrically coupled to the cable box for receiving a video signal;
         a controller for monitoring timing between successive VSynchs of a video signal for a first
channel from the cable box to the television tuner;
         responsive to the monitored timing, means for tuning the cable box to a second channel;
5   and
         means for tuning the cable box back to the first channel.

         24.   The system of claim 23 wherein the controller is a VChip controller.

10   25.   The system of claim 23 wherein the controller is a VChip Plus + controller.

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FIG.1A

CABLE FEED

CABLE BOX — 7

CH.3/4

V-CHIP PLUS+ TV — 8

REMOTE CONTROL — 1

9a

IR MOUSE — 2

9b

FIG.1B

```
                     ┌─────────────────────┐ ⟵ 101
            ┌───────▶│    SET  TIMING      │
            │        │      WINDOW         │
            │        └─────────────────────┘
            │                   │
            │                   ▼
            │        ┌─────────────────────┐ ⟵ 102
            │        │     MONITOR         │
            │        │  VSYNC  TIMING      │
            │        └─────────────────────┘
            │                   │
            │                   ▼
            │               ╱───────╲          103
            │             ╱  IS VSYNC  ╲      ⟵
            │            ╱ DISTURBANCE   ╲   NO
            └───────────◀  OUTSIDE TIMING  ▶──────
                         ╲    WINDOW     ╱
                          ╲     ?      ╱
                            ╲───────╱
                                │ YES
                                ▼
                     ┌─────────────────────┐ ⟵ 104
                     │ TUNE CABLE BOX TO   │
                     │ A  SECOND  CHANNEL  │
                     └─────────────────────┘
                                │
                                ▼
                     ┌─────────────────────┐ ⟵ 105
                     │    SET  TIMING      │
                     │      WINDOW         │
                     └─────────────────────┘
                                │
                                ▼
                     ┌─────────────────────┐ ⟵ 106
                     │ TUNE CABLE BOX TO   │
                     │  CORRECT  CHANNEL   │
                     └─────────────────────┘
                                │
                                ▼
                            ╱───────╲          107
                          ╱  IS VSYNC  ╲      ⟵        ┌──────────┐ ⟵ 108
                         ╱ DISTURBANCE   ╲  YES         │  BLOCK   │
                        ◀  OUTSIDE TIMING  ▶───────────▶│  SCREEN  │
                         ╲    WINDOW     ╱              └──────────┘
                          ╲     ?      ╱
                            ╲───────╱
                                │ NO
                                ▼
                     ┌─────────────────────┐ ⟵ 109
                     │        STOP         │
                     └─────────────────────┘
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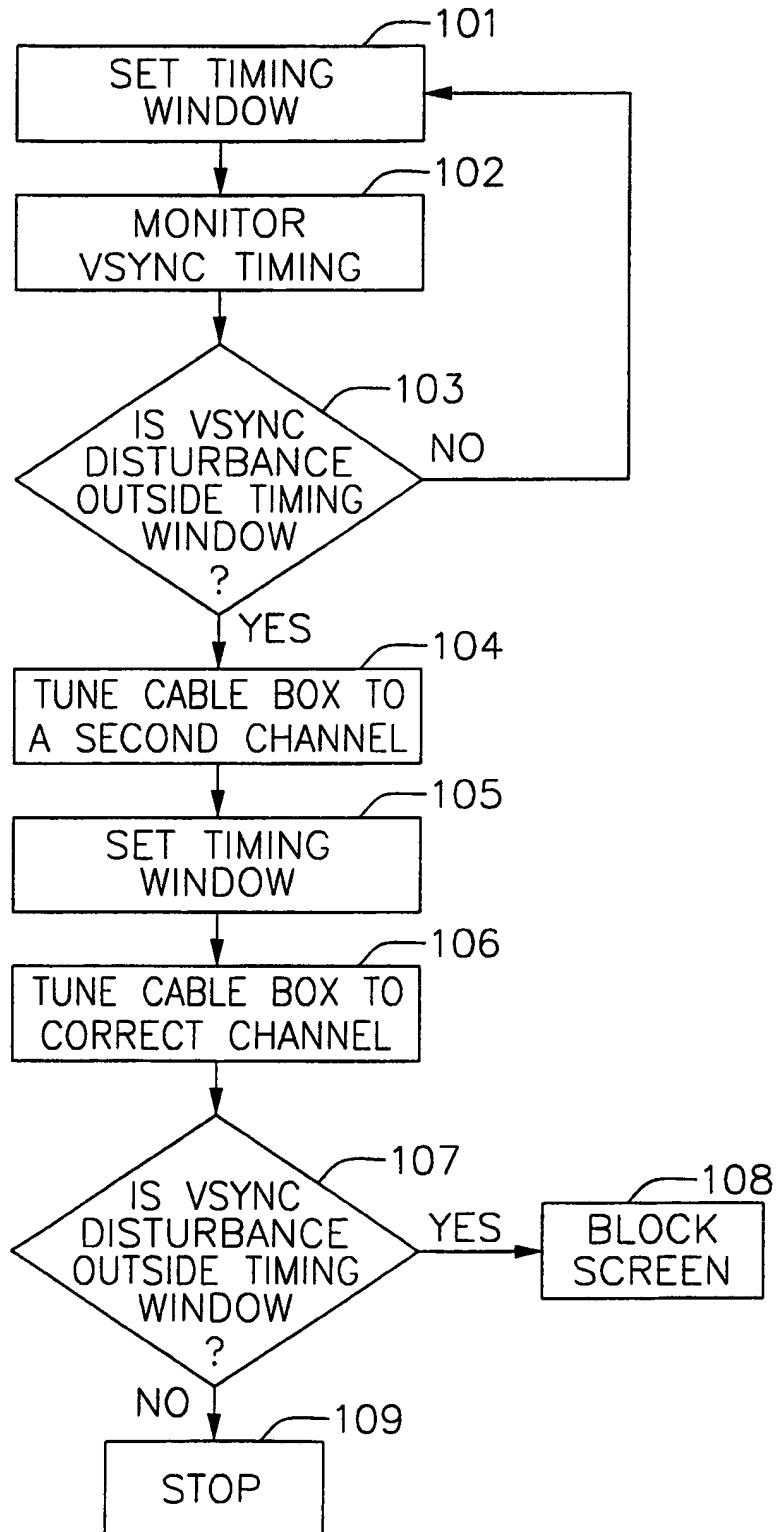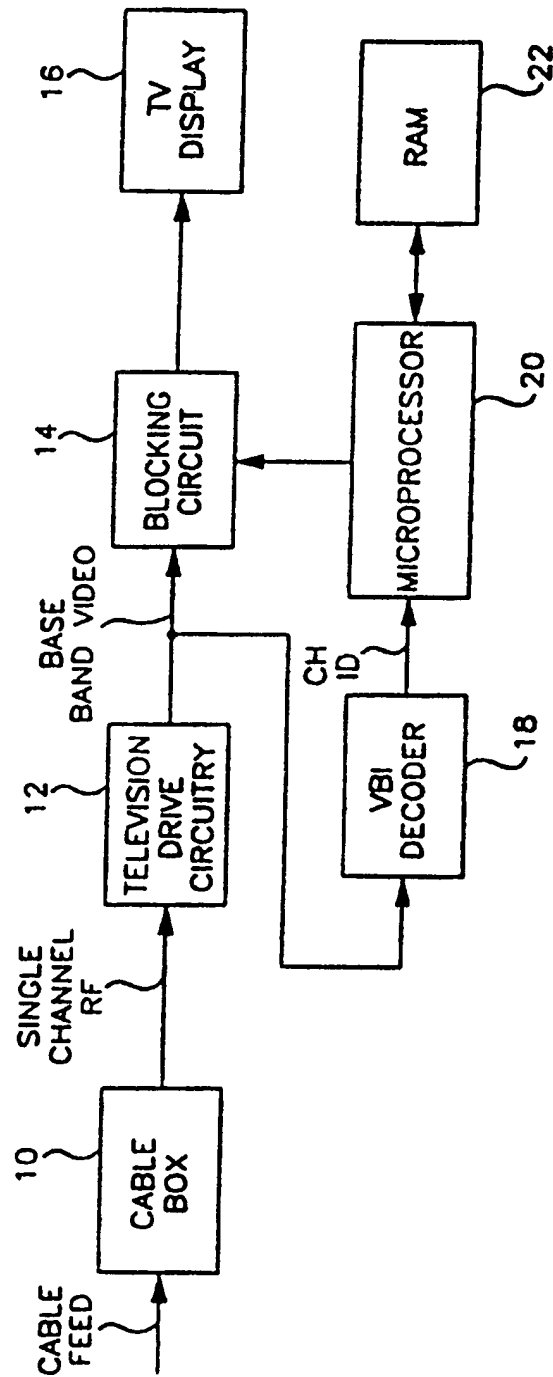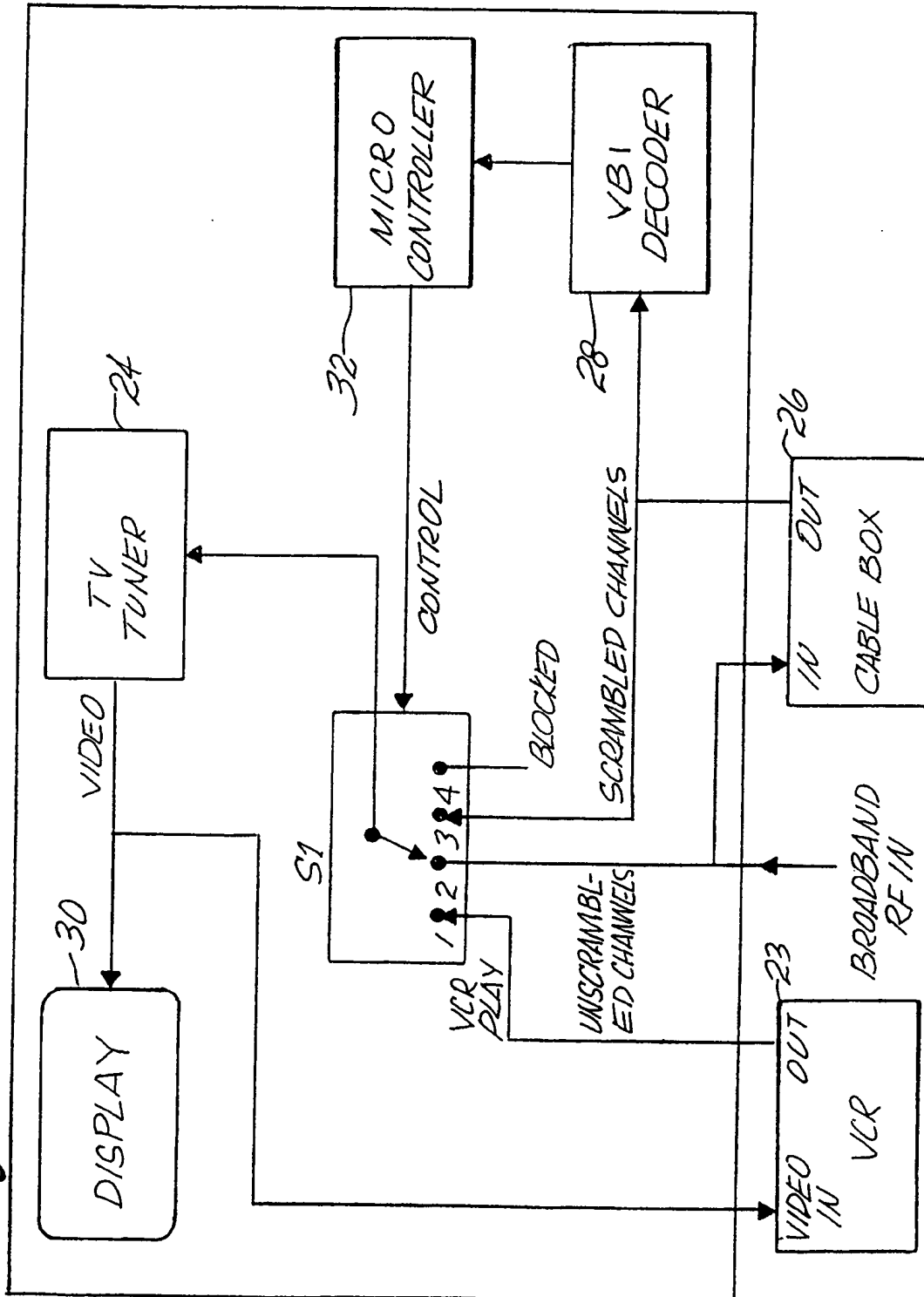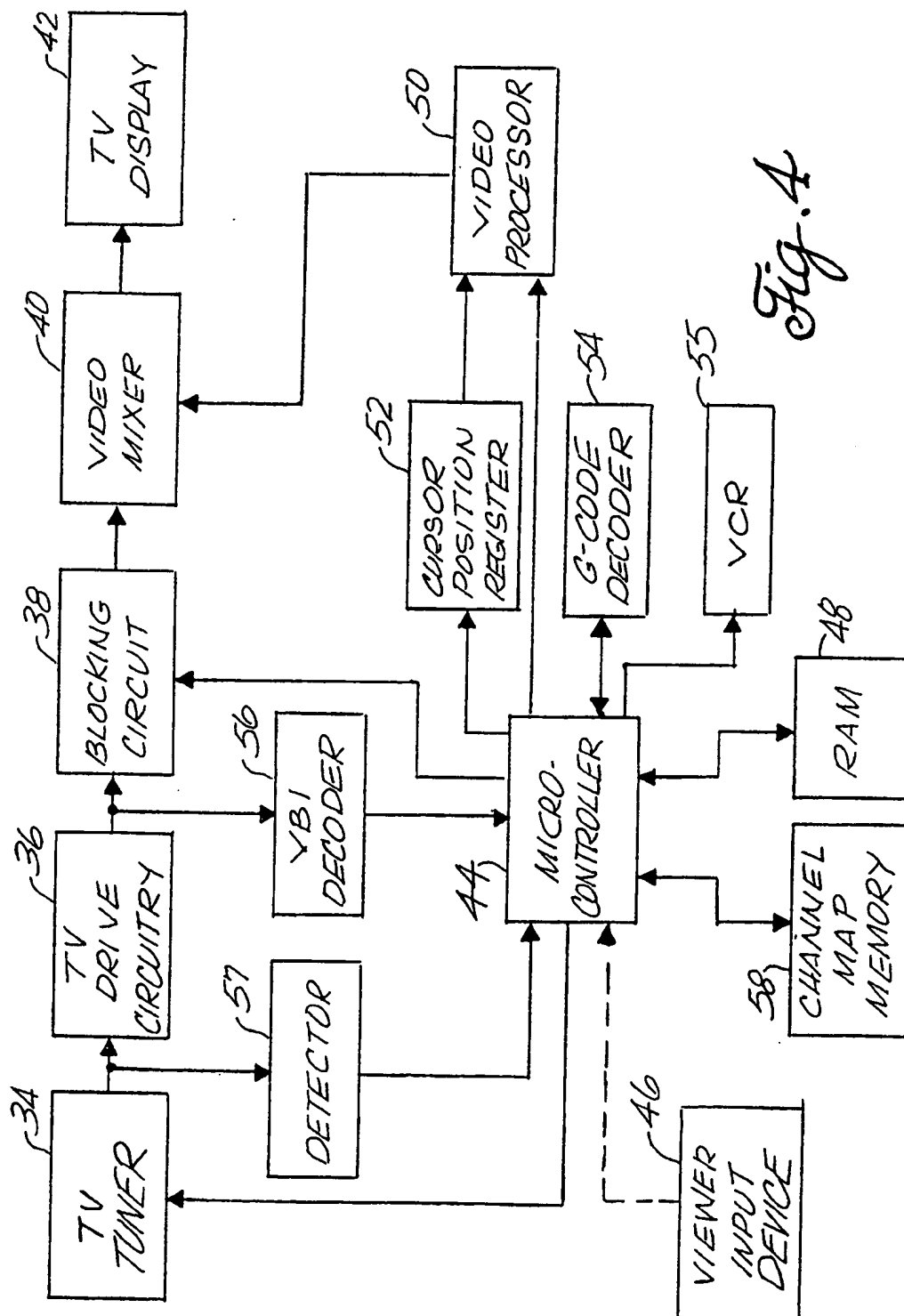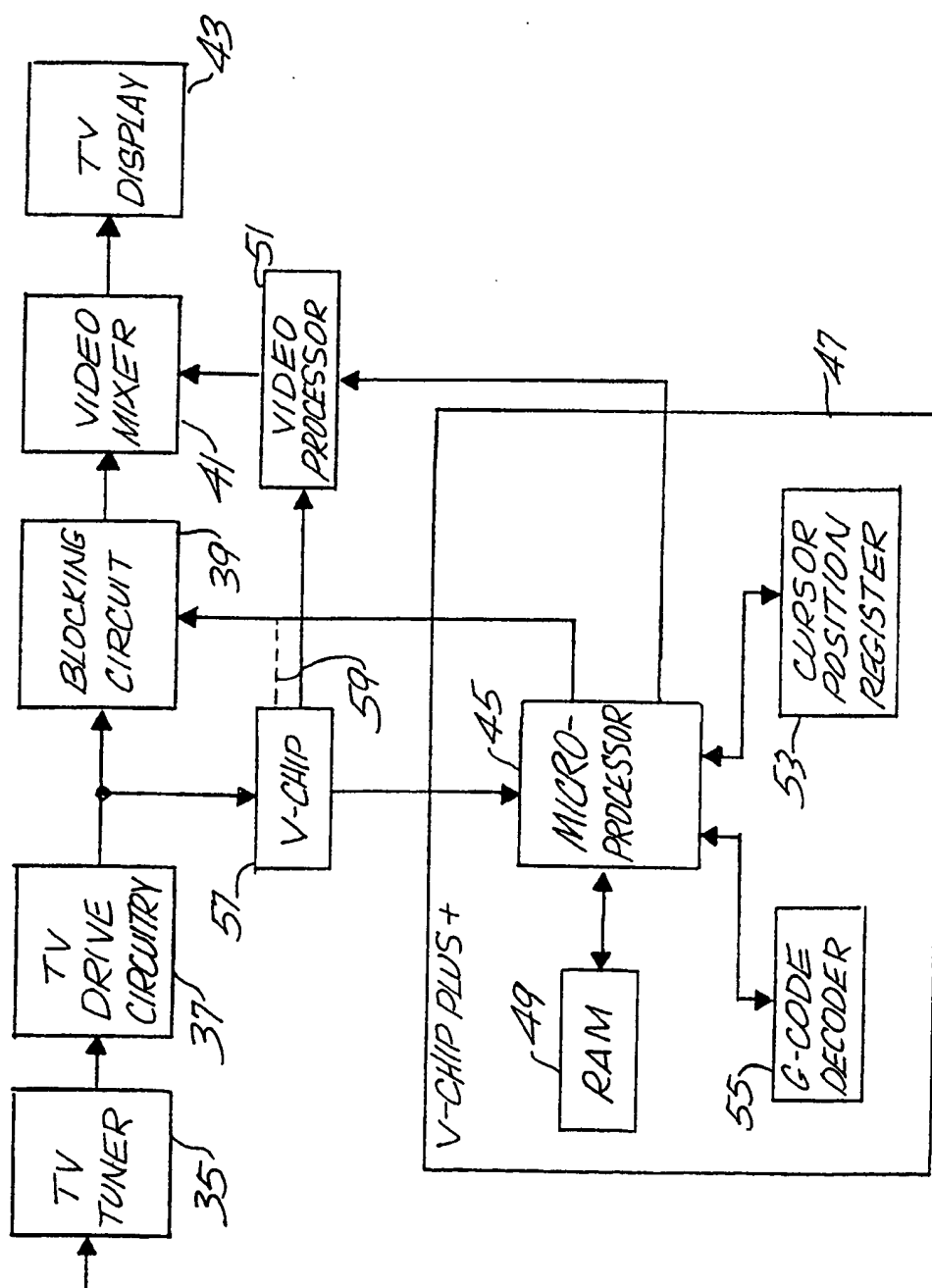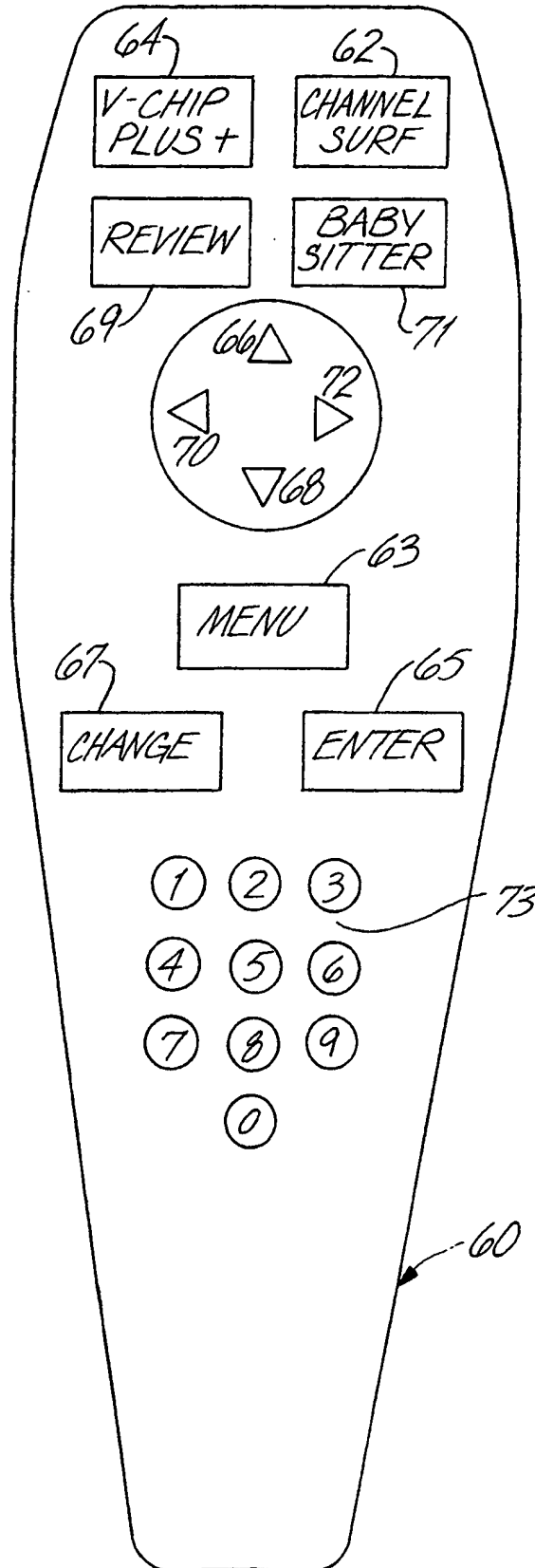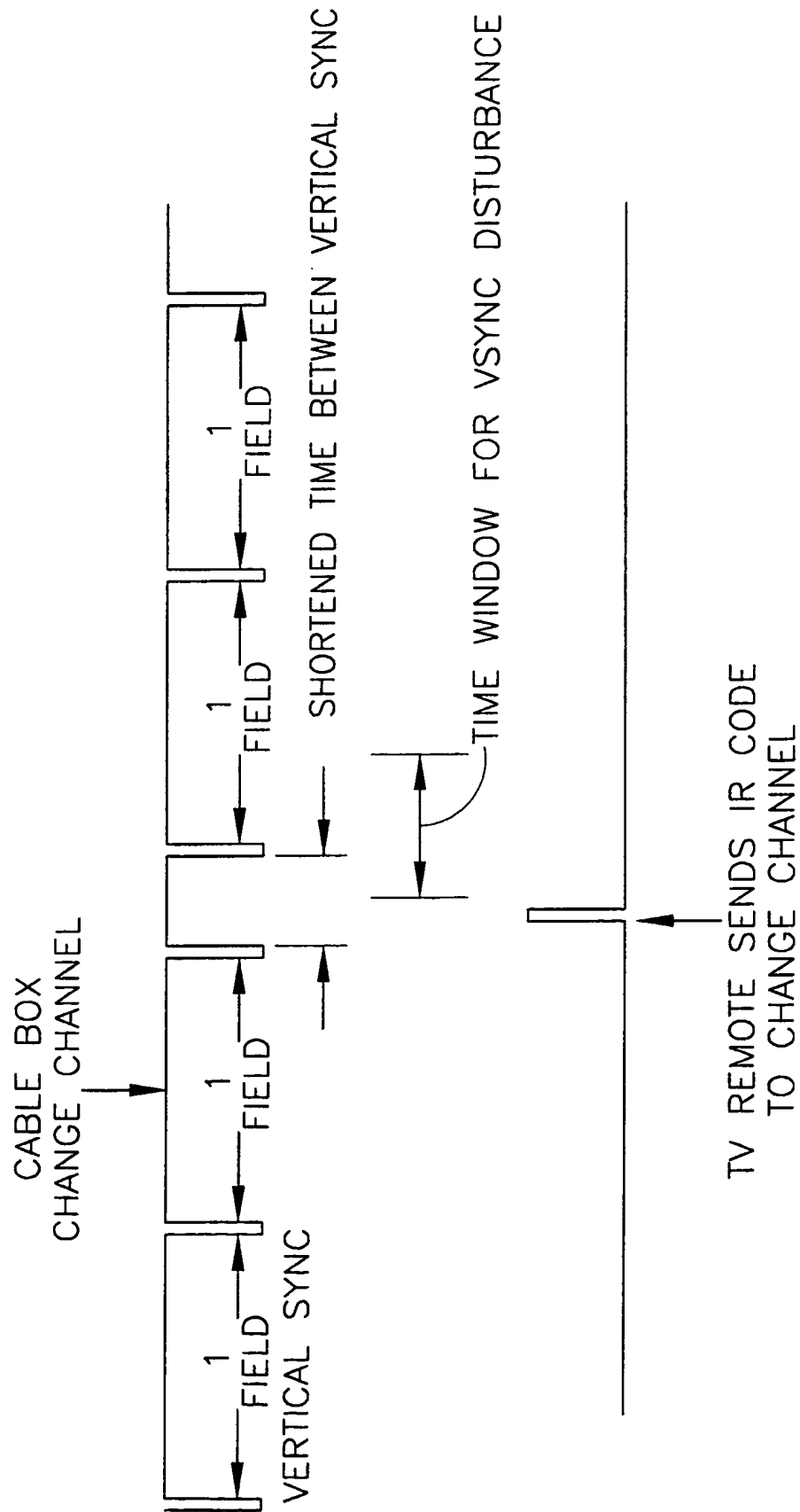
Fig. 2

Fig.3

Fig. 4
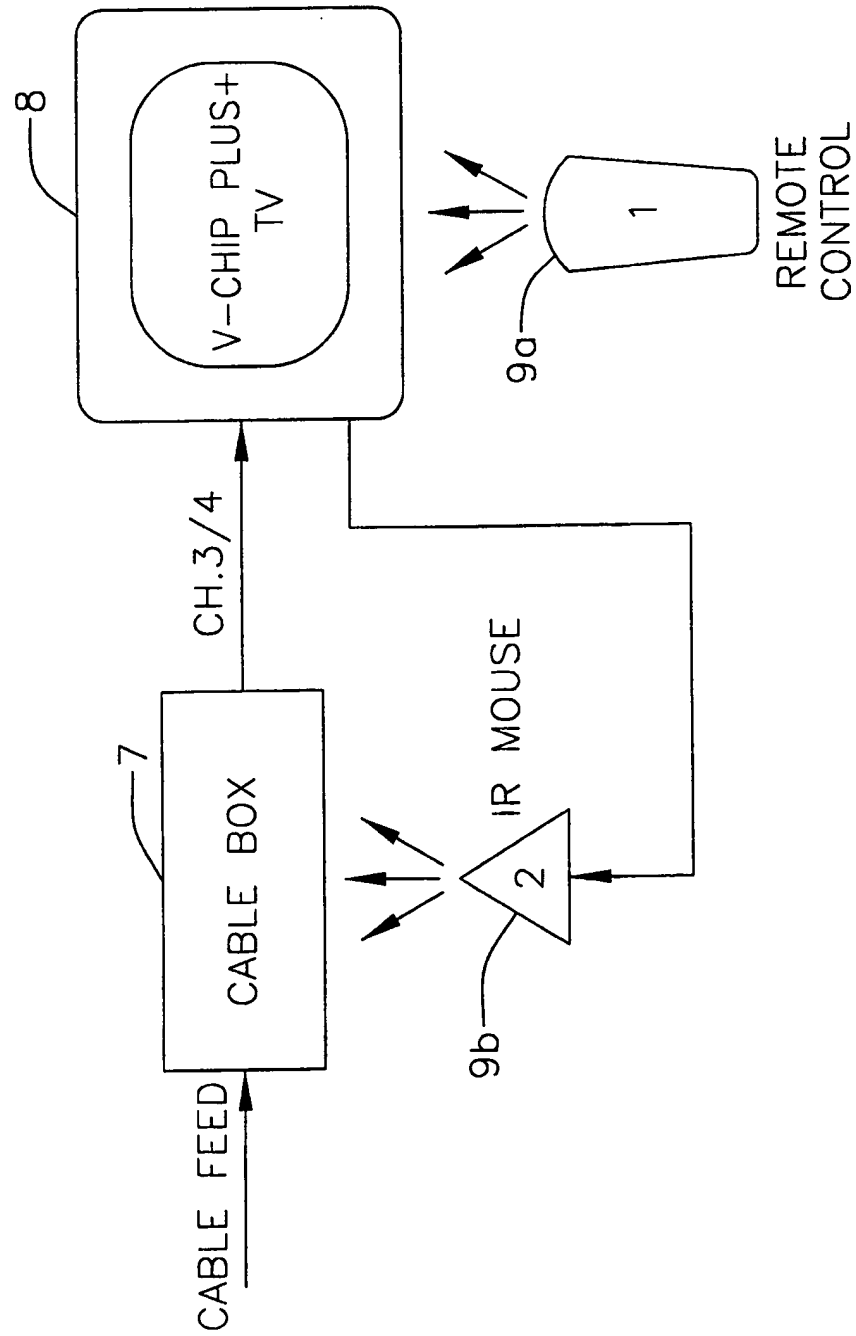
Fig. 5

Fig.6

FIG.7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/23710

A.   CLASSIFICATION OF SUBJECT MATTER

IPC(6)   :H04N 7/16, 7/00, 17/00

US CL   :348/4, 5.5, 194

According to International Patent Classification (IPC) or to both national classification and IPC

B.   FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. :   348/4, 5.5, 194

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

STN, VChip, channel change, v sync or vertical sync

C.   DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,715,014 A (PERKINS et al) 03 February 1998, col. 1, lines 1-67, col. 2, lines 20-67.	1-25
A	US 5,420,647 A (LEVINE) 30 May 1995, Fig. 2, cols. 3-5.	1-25
A	US 5,495,282 A (MOSTAFA et al) 27 February 1996, col. 26, lines 54-67, cols. 29-32.	1-25

☐   Further documents are listed in the continuation of Box C.   ☐   See patent family annex.

*	Special categories of cited documents:	"T"
"A"	document defining the general state of the art which is not considered to be of particular relevance	
"E"	earlier document published on or after the international filing date	"X"
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"O"	document referring to an oral disclosure, use, exhibition or other means	
"P"	document published prior to the international filing date but later than the priority date claimed	"&"

"T"   later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"   document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"   document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"   document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 NOVEMBER 1999	03 FEB 2000

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